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AN INAUGURAL DISSERTATION
ON
FRACTURES OF THE LEG.

SUBMITTED
TO THE EXAMINATION
OF THE
REVEREND JOHN ANDREWS, D. D. Provost,
(PRO TEMPORE),
THE
TRUSTEES, AND MEDICAL PROFESSORS
OF THE
UNIVERSITY OF PENNSYLVANIA,
ON THE SEVENTH DAY OF JUNE, ONE THOUSAND EIGHT
HUNDRED AND FOUR,
FOR THE DEGREE OF DOCTOR OF MEDICINE.

BY JOHN PARKER,

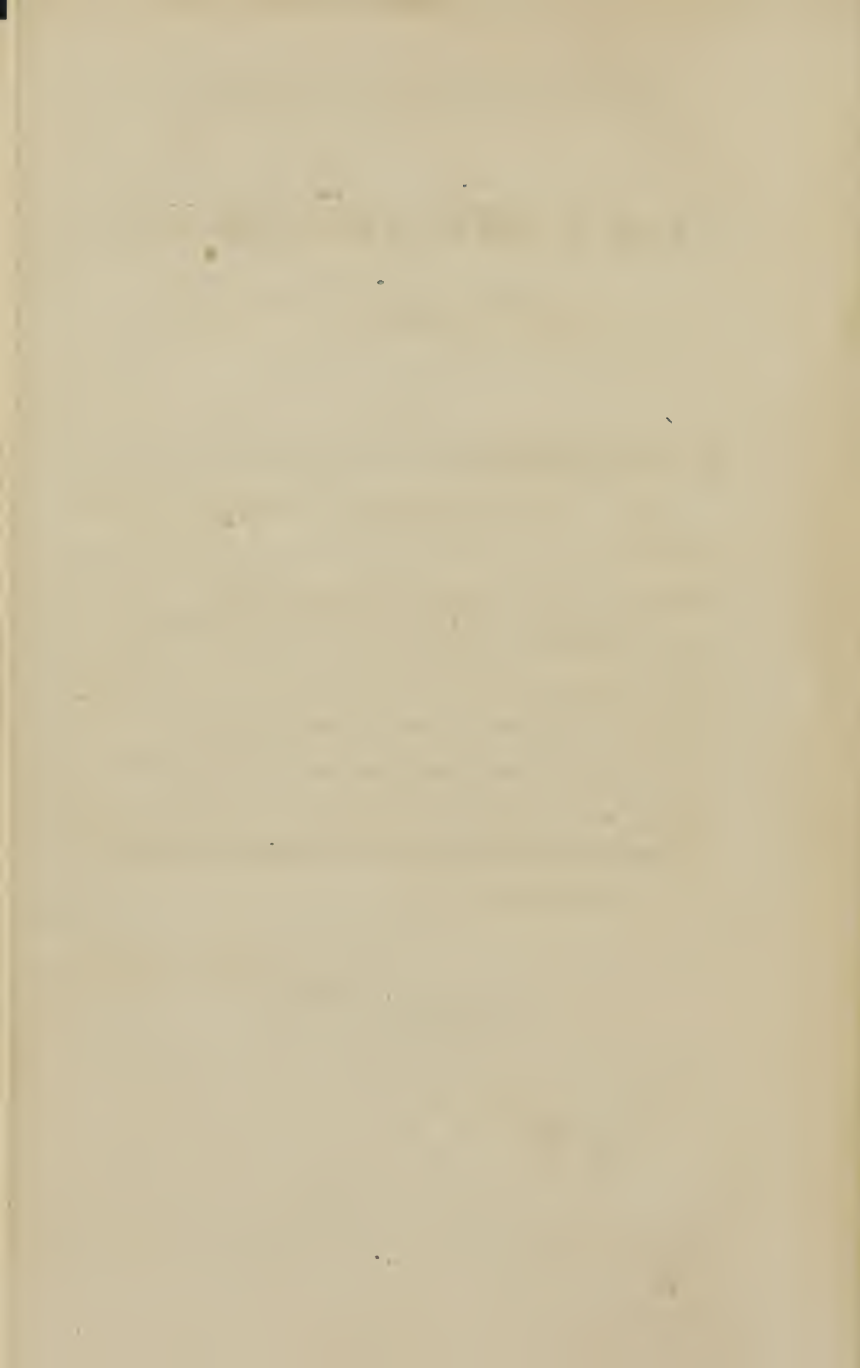
OF NORTH CAROLINA;

MEMBER OF THE PHILADELPHIA MEDICAL SOCIETY.

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1804.



TO DOCTOR ANDREW KNOX,
OF NIXONTON, NORTH CAROLINA.

ESTEEMED FRIEND,

THIS Essay is inscribed as a mark of gratitude, for under thy attentive direction my pursuits in medicine have been accompanied with pleasure and satisfaction. Permit me, therefore, when departing from thee, to intreat a continuance of those salutary councils which I have found so useful during the course of my studies. That thy passage through life may be as lasting and happy as it has hitherto been useful, is the most ardent wish of thy sincere friend and pupil.

THE AUTHOR.



TO THOMAS BROWNRIGG, ESQUIRE,
OF CHOWAN COUNTY, NORTH CAROLINA.

ESTEEMED FRIEND,

THIS Essay is also dedicated as a tribute of respect, in which it affords me the highest degree of satisfaction to be able, thus publicly, to return thee my sincere thanks for the many acts of kindness, both in a public and private capacity, and for the repeated testimonies of friendship which I have ever experienced. Nor shall I fail to accompany thy progress through life, with my most fervent wishes for thy health, prosperity, and future happiness.

THE AUTHOR.



A DISSERTATION
ON
FRACTURES OF THE LEG.

CHAPTER I.

CAUSES AND SYMPTOMS OF FRACTURES.

FRACTURES of the bones of the lower extremities require more attention on the part of the surgeon than those of any other bones of the body, unless it be fractures of the cranium. The deformity occasioned by an alteration in the length of one of the lower limbs, is attended with more serious consequences than if such an accident had happened to the upper extremities. Their consequences, I will venture to say, can, in almost every case be prevented from succeeding a simple fracture of the leg, provided the patient be submissive to the surgeon's directions, and that mortification, or

other circumstances not often attending simple fractures, do not occur.

Fractures have been divided into simple and compound, and these again into transverse, oblique, longitudinal, and splintered. It would be needless to give a definition of these terms as they are so familiar to every one acquainted with surgery.

The causes of fractures are generally external injuries, and violent action of the muscles.* The latter I believe is the most common of the two, for the following reasons :

First....Because fractures happen more frequently in winter than in summer, some have improperly attributed this to the bones being more brittle at that season of the year; but as the muscles act with more force in cold than in warm weather it is doubtless owing to their action.

Secondly....Because a man, when drunk, seldom gets any of his bones broken. Now it is well known, that the muscles of a man, when intoxicated, act but feebly.

To ascertain the existence of a fracture is not often attended with much difficulty, unless the patient be very fat, or much inflammation and

* We think it unnecessary to mention those diseases which render the bones more likely to be broken, such as *mollities ossium*, *Rickets* and *Scrofula*.

swelling have supervened; but when these last mentioned symptoms are observed, no attempt should be made to examine the limb, until, by proper remedies, they are removed.

The following are the symptoms of a fractured leg:

The limb is generally distorted and shorter than the sound leg. The patient is unable to stand upon it; swelling in consequence of an effusion from divided vessels is observed over the fractured part. The muscles are sometimes thrown into convulsive action, a crackling or grating sensation called crepitus is felt upon rubbing together the broken ends of the bones.

CHAPTER II.

OF THE UNION OF BROKEN BONES.

HAVING, in the preceding chapter, mentioned the causes and appearances of a fractured leg, we shall now proceed to make a few observations on the formation of callus, or that substance which is the bond of union between the broken bones ; and here we shall not be particular in relating the opinions of the different authors who have treated on this subject, but be satisfied with mentioning those most generally adopted.

The theory of the celebrated Duhamel, which supposes the matter of callus to be formed from the periosteum, is now almost universally neglected, except by some of the French physiologists, who still support it. Doctor Nisbet, in a work entitled

“Human Osteogeny,” published so far back as 1736, supposes the new bone to be secreted. The late illustrious John Hunter, in consequence of his deep and successful researches into the laws of the animal body, has satisfactorily proved, that all new parts are formed from the blood. In simple fractures the blood that is effused from the divided vessels coagulates between the divided bones, and thus forms a weak connexion between them. The blood becomes firmer, and vessels are observed in it, which are produced by an elongation of those of the bones. It gradually becomes nearer to the nature of bone, and generally, at about the end of four weeks, the union is accomplished. This may be compared to the union of flesh by the first intention. If the blood that was effused is “lost or is deprived of its life,” the union is accomplished in a manner somewhat different. The adhesive inflammation seizes the ends of the bones and adjacent parts, and coaguable lymph is thrown out: this becomes vascular, and gradually increases in hardness, as in the former mentioned mode of union. In those compound fractures that cannot be converted into simple ones, the blood effused from the vessels is lost through the wound; and from the injury being more extensive, the stimulus of imperfection is felt in a greater degree. Suppurative inflammation super-

venes, after the formation of pus, granulations arise from the ends of the bones, come in contact with one another, meet, and unite. At first they are soft and are of the consistence of granulations arising from flesh, but slowly become as firm, and as hard as the original formed bone. In some cases, the bones shew no disposition to unite. This may be owing to a variety of causes, which we shall not take up any time to consider. I have only to add, that when this happens, through the ingenuity of our countryman, Doctor Physick, we are supplied with a successful, safe, and easy method of cure, which will be noticed in the course of the essay.

CHAPTER III.

OF THE MANAGEMENT OF FRACTURES.

IN this chapter we shall consider the method of treating fractures, both simple and compound. We will commence with the former.

Simple fractures will require our attention in proportion to the injury sustained by the limb. Thus, when the bone, or bones of the leg are but broken, and little injury is done to the skin, muscles, and adjacent parts, there is a probability that but a small degree of fever, and inflammation will supervene ; but if the limb be contused, the degree of inflammation will be greater. If the fracture be oblique, it will require more attention than if it were transverse, and if a considerable time has elapsed since the accident, and much inflammation

has come on, before our visit to the patient, the treatment will be different than if we were called immediately after the injury had been inflicted. And again, if both the tibia and fibula be broken, it will be more difficult to retain them in their proper situation, than if either of them had been fractured separately.

When the fibula is broken about its middle, or near its upper extremity, the limb generally retains its natural figure; and the only method of ascertaining the existence of such a fracture, is by making pressure with the fingers along the fibula, the crepitus will be observed at the broken part, and the fractured ends of the bone will yield to the pressure. The treatment of such an injury is very simple: the patient is to be placed on a mattras, on his back, with the injured limb resting on a pillow; after the fracture is reduced, a roller, or an eighteen tailed bandage is to be applied to the leg, reaching from the ankle to the knee. In using the bandage, we must be careful not to have it too tight, our object should be only to keep up a moderate degree of pressure. A splint of either pasteboard or wood, which should reach from the upper to the lower end of the leg, is to be applied on the outside of the leg, and retained there by pieces of tape: the tapes may be made tighter at the upper and lower extre-

mity of the splint than in the middle. If inflammation should come on, the splints and bandages are to be removed, the limb is to be placed in a flexed position, and bleeding, gentle laxatives, and cold applications to the leg are to be made use of. The dressings are to be reapplied as often as they get displaced, provided there be no inflammation. At the end of twenty-five, or thirty days the union is generally accomplished.

In that species of fractured fibula accompanied with a dislocation of the tibia, which has been so happily described by the illustrious Pott, I should suppose the same method of treatment would answer, only with this exception, that in these cases we must visit our patients more frequently, and be more careful to see that the foot is not distorted, and that the bones is in their proper situation. However, as this is a subject on which the most eminent surgeons have differed in sentiment, I wish to avoid as much as possible the consideration of it. When the tibia is broken, and the fibula has sustained no injury, the same treatment will also answer, with this difference, that a splint should be applied on each side of the leg; for by this practice the splint applied on the inside of the limb, can be better retained in its situation, and the tape which secures it can be made tighter without occasioning

excoriation, the splint on the opposite side defending the skin. When the tibia and fibula are both broken, the limb is generally distorted, particularly if the fracture is oblique; but when the bones are transversely broken, they are not often displaced, and no other deformity is observed than swelling over the fractured part.

The fracture is to be reduced by one assistant making extension at the foot, and another counter extension at the knee, whilst the surgeon replaces the bones. The patient is to be placed on his back, with a mattras under him, this would be preferable to a bed, as it is less liable to yield. When the dressing is complete, the leg is to be confined in a straight position. A great difference has existed among surgeons with respect to the propriety of this position. The celebrated Pott is not favourable to it, and gave the preference to a flexed state of the limb. Dessault, whose experience must be at least equal to that of Pott, decides in favour of the straight position. Having always been accustomed to see fractures placed in this manner, I shall not hesitate to recommend it to others. The patient is sometimes restless for the first day or two, but soon becomes familiarised to his new posture, and seldom desires to change it. Another advantage also attends this position that does not belong to the other; I mean the better

opportunity the surgeon has of comparing the fractured with the sound leg, and thereby being better enabled to judge whether the bones are in their proper situation. Having got the patient on a mat-trass a pillow is to be introduced under the limb, and the eighteen tailed bandage is to be applied, so as to make a small degree of compression ; splints of wood, or pasteboard, which should reach from the knee to the sole of the foot, are then to be bound on with pieces of tape.

If inflammation should supervene, bleeding and cold applications should be made use of, the splints and bandages should be loosened, and the limb is to be placed in the flexed position. If the muscles be affected with convulsions, bleeding, together with opiates, are to be prescribed. About the tenth day the dressings ought to be removed, and the leg examined ; they are to be again applied, and removed as often as is necessary, until about four weeks from the time of the accident, when the union will generally be found to be accomplished. When the bones of the leg are obliquely broken, it is more difficult to retain them in their proper situation than if the fracture were transverse : hence, the frequency of lameness succeeding these cases. The treatment recommended by Pott, Bell, and the

generality of English surgeons, is nearly the same as that which they use in transverse fractures; but the success attending their method is by no means great, as little or no extension is kept up by it, on which the straightness of the limb depends. On this subject I conceive the practice of the French surgeons to be far superior to that of the English, as their principal object is to keep the limb extended until union has taken place. So far back as 1752, M. Contavoz describes a machine to keep up the extension, which will certainly have that effect, but it is so complicated as to be both expensive and very inconvenient.

The celebrated Dessault has invented splints and bandages for extending the leg in oblique fractures, but has not been so happy in this as in his other improvements; for whoever will read that part of his work on this subject, will at first sight observe that his apparatus, though it will keep up the extension, yet will not do it with facility. A new method of treating oblique Fractures of the Leg has been lately invented by Doctor James Hutchinson, of this city. It has been used with very great advantage in several cases, and I had the pleasure of witnessing its good effects in a case of compound fracture, which occurred last winter. I

shall proceed to describe it : the places for making the extension and counter extension, are the same as those recommended by Contavoz, and Dessault, viz. the former is at the lower end of the leg, directly above the malleoli, and the latter at the upper end, just below the tuberosity, on the anterior part of the tibia. On each side of the leg, where the counter extension is to be made, two pieces of tape are to be placed in the direction of the limb, and secured moderately tight, by a roller passed several times round them ; one turn of the roller being made on the other in such a manner as to let the ends of the tape be loose both above and below, on each side of it. At the place for extension, on each side of the leg, a piece of tape is also to be placed and secured in the same manner ; but the pieces of tape confined by the bandage at the lower end of the limb, should be several inches longer than those at the upper.

Two splints are next to be chosen, which should reach from the knee to about eight inches below the foot. They ought to be about four inches broad, and an half an inch thick : the upper end of each splint is to have four holes bored in it, two of which are to be near the superior edge, about two inches distant from one another, and

two near the inferior in a right line with the two superior, and the same distance apart. About four inches from the lower end of each of the splints another hole is to be made. The limb being extended, the tapes under the roller at the upper end of the leg, are to be passed through the holes, at the upper end of the splint and tied moderately tight; this secures the splints to the limb, and keeps up the counter extension. Through the hole at the lower end of each of the splints, a piece of wood about four inches long is to be passed so as to connect the two splints together: the tapes, under the bandage above the malleoli are to be drawn tight, and tied to the piece of wood, at the lower ends of the splints. This keeps up the extension.

It was first supposed that the bandage at the upper end of the limb, would obstruct the return of the venous blood, and perhaps bring on inflammation, but by experience we have found that no such inconvenience ever occurs. The extension kept up by these splints can be continued, without ever removing them, during the whole cure.

I presume it is understood, that the above described dressings, are not to be applied when inflam-

mation exists, and that they are to be removed should it supervene.

Having concluded our remarks on simple, we shall proceed to make a few on compound fractures. These are always attended with more danger than simple, and the degree of danger is in proportion to the injury received.

It cannot be expected, that I should attempt to discuss the propriety of amputating in certain cases ; none but a person of great experience ought to venture upon such an important work. I have but just “ entered the threshold of science,” and it would be presumption in me to meddle with the subject : I shall therefore begin with the means necessary to be used in saving a limb. The first thing requiring our attention, is the hemorrhage for the suppression of which, the tourniquet is to be applied round the thigh in such a manner as to compress the femoral artery, the bleeding vessels are then to be looked for, and secured by ligatures.

All extraneous matter, such as dirt, rags, or loose spiculæ of bone, are to be removed, if it can be done without danger, or giving much irritation; the clots of blood are also to be washed away. We are next to attempt to reduce the fracture, and this should always be done immediately, if it can be

accomplished without much difficulty; but it sometimes would require so much force as would be likely to give more irritation than by suffering them to remain displaced, in such cases it would be better to wait until suppuration comes on, when they can be reduced more easily.

Convulsive action of the muscles sometimes attend compound fractures. This symptom, though it is attended with disagreeable consequences, and always prevents us from reducing the fracture, can be easily removed by bleeding until faintness comes on. I know that there are many eminent surgeons, in such cases, recommend the free exhibition of opium; but in this country, where the use of the lancet is more free, and I will venture to say more successful, it has been found by experience to be attended with the greatest advantage. Dr. Physick, in his lectures, warmly recommends it, and to him we are indebted for its more general introduction into practice.

If the wound accompanying the fracture be much lacerated, or contused, it will be unnecessary to make any attempt to heal it by the first intention, for in such cases no union will take place, and it would therefore be better to accelerate suppuration, and the application of an emollient cataplasm would be most proper. But if the wound be made with a

clear cutting instrument, our practice should be directly the reverse; the lips of the wound ought to be brought into contact, and retained there by slips of adhesive plaster, or by sutures; and if union by the first intention takes place a compound will be reduced to a simple fracture. Having got our patient on a mattress, and his limb in the straight position, reduced the fracture, and applied the dressings to the wound, the limb is to be bound up in the manner recommended in the preceding pages for transverse fractures; but great care is to be taken that the bandages and tapes be not too tight. After the inflammation and swelling have gone down, which generally happens by the eleventh or twelfth day, the splints of Doctor Hutchinson will be peculiarly advantageous; for if the fracture hath not united by the first intention, the necessary dressings may be applied to the wound without disturbing the limb; the extension being kept up all the time. If the injury suffered by the limb be very extensive, fever and inflammation will supervene in proportion; delirium sometimes comes on, and if the restless patient be not well watched, he will aggravate these symptoms by tossing about the fractured limb. The splints and bandages should now be removed, the limb is to be placed in a flexed position, and blood should be drawn in as large quan-

ties as the patient will bear. In prescribing this remedy we are to be guided by the pulse, and the general strength of the patient. Topical bleeding, by leeches, will also be of the greatest advantage, as it acts more directly on the affected part. Cold applications, such as the saturnine poultice, will also be very serviceable. Some surgeons have recommended the free exhibition of purgatives; these certainly tend to remove inflammation, but the injury done to the limb by the frequent rising of the patient to stool, will do more harm than is readily imagined; I should therefore not use them unless it be to keep the patient's bowels gently open. It sometimes happens, that notwithstanding all our exertions the inflammation will terminate in mortification, when this takes place the swelling increases, vesicles make their appearance, and the part changes from a red to a livid, and from that to a black colour; it next loses its sensibility and becomes cold and dead. As long as the inflammation continues, the mortification will spread: we are to continue evacuating, and the limb is to be frequently fomented. When the inflammation and fever subsides the mortification will stop; our plan is now to be changed, and bark and wine are to be prescribed according to the state of the pulse and strength of the patient, the fermenting cataplasmi

may be applied to the limb. The dead part ^{suppurates} ~~suppurates~~ ^{a-} rates from the living, and sometimes the latter is so unequal and irregular as to make amputation adviseable; but of this we are not to determine; we are supposing it possible to save the limb. The discharge by suppuration will now be very great, and our principal object will be to support the strength of the patient under the discharge by a generous diet, bark, and wine. The parts will gradually be restored, and the applications to them are to be varied according to the different changes they undergo.

CHAPTER IV.



OF FRACTURES THAT WILL NOT UNITE.

IT sometimes happens that fractures have no disposition to unite. This has happened from a variety of causes, such as frequent friction between the fractured ends of the broken bone, or a muscle, or tendon getting between them : the remedies formerly used in such cases are attended with great uncertainty and danger, such as making an incision down to the extremities of the fractured bone, and sawing them off. This often failed, and sometimes injured the limb so as to make amputation necessary. Doctor Physick, of this city, whose improvements in surgery entitle him to the highest honour, has invented a method which promises to be safe, certain, and easy of accomplishment. An account

of it will be found in the first volume of the second Hexade, of the New-York Medical Repository. The method of Doctor Physick consists in passing a seton needle, armed with a skein of silk through the limb, and between the fractured ends of the bone. This was done in a case which occurred in the Pennsylvania Hospital, and after the seton had remained in the arm about thirteen or fourteen weeks, the union began, and the bone gradually united. The callus thus formed is so firm that the patient is now capable of doing any labouring work, and says he enjoys the use of his arm as well as ever.

I have now concluded this essay, and must crave the indulgence of the reader for its imperfections. Necessity, and not choice, compelled me to write.



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